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STUDY
PLAN

COMPUTER SYSTEMS STUDY

DIVISION OF ADMINISTRATIVE MANAGEMENT

U. S. FOREST SERVICE

DEPARTMENT OF AGRICULTURE

303645

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I. PROBLEM STATEMENT

The rapid growth in the use and desire to use the computer
has been accompanied by related problems that seem to indicate
that our efforts in data processing may have been less than
fully successful. On the surface it appears that the Forest
Service is currently not obtaining full value from the potentials
of the computer as a tool for management and all of its other
activities. Because of this situation, a plan to establish the
objectives, priorities, and direction to be taken in the use of
the computer as a tool in the Forest Service is critically needed
if we are to take advantage of the advanced methods that it makes
available.

Because of the long-lead time for systems design, programming,
and equipment acquisition and the large investment of personnel
and funds required for automated systems, long-range planning is
a necessity. Without top level direction and guidance tied to
program plans, a data processing plan would be almost meaningless
since it could be out-of-date by the time it was completed. In
view of equipment saturation, inadequacy and pending implementation
of a number of automated systems requiring increased computer
capabilities, the need for information upon which to base a
number of complex interrelated decisions regarding data processing
is upon us now. If we are to make better use of the computer which
has been shown to be capable of providing a real opportunity--the
means--of meeting the challenges of today and tomorrow in land
management, this information will need to be obtained.

II. <u>STUDY OBJECTIVE</u>

The objective of this study is to define the Forest Service's computing requirements and to develop and implement a plan for meeting them. The plan is to provide for the use of the computer as a tool for continued improvement in both the efficiency and effectiveness of the Forest Service.

In the conduct of this study key areas to be covered include:

1. Determine the Service-wide present and future computer needs including equipment, personnel and organizational requirements.

2. The design and development of plans for meeting computer requirements including equipment, organizational and personnel considerations.

3. Implementation of the plans that are developed in such a way that the ability of the Forest Service to meet its overall objectives is strengthened.

III. CURRENT SITUATION

The following is a summary of some of the major problems
facing the Forest Service that are related to our data processing
program.

A. Applications

The number, variety, and complexity of Forest Service data
processing applications have been increasing at an explosive rate.
The automation of many applications without coordinated planning
is resulting in duplication of programming and systems development
effort between units and between applications. Because of equip-
ment and staff limitations many opportunities to utilize the
computer as a tool for improvement of management have been lost.
Major application areas that are being considered and will have
an impact on data processing in the Forest Service include:

1. New Accounting System. In view of the inadequacy
of existing equipment for handling this system, some type of
action is needed before this system can be implemented. The
accounting system will not operate on the Univac 1005 computers
now available in four Regions.

2. Management Information System. The development
of a management information system by the INFORM project is
another key application both from overall value to the Forest
Service and its relation to this study. While plans for the
implementation of a system of this type are not yet firm, it
is extremely doubtful if a system of the type described by the

INFORM project, can be handled on any of our present equipment in view of existing workloads and equipment capabilities.

3. RIM. The RIM system currently operating on equipment at the University of Georgia is to be integrated into a general Management Information System in accordance with the recommendations of the INFORM project.

4. PPBS. While the long-range processing requirements of the Program Planning and Budgeting System are as yet indefinite, the need for substantial computing capabilities to handle the work involved is quite apparent.

5. Advanced Engineering Systems. Advances in mechanized systems in civil engineering and the application of new techniques to road design and planning are rapidly outdistancing the capabilities of available owned equipment.

6. Resource and Facility Inventories. The combination of stepped-up efforts and intensity of resource inventories is another area in which the capabilities of our largest computers are already being stretched.

7. Scientific Computing. The techniques utilized in research and to a lesser extent in administrative studies often require the utilization of highly advanced computing techniques without which this work would be severely handicapped. These requirements need to be analyzed so that we have a basis for assuring they can be provided in the most effective manner that is fully compatable

with the objectives of the Forest Service.

8. <u>Multiple Program Accomplishment Report System</u>. This planned system permits State and Private Forestry personnel to prepare a single report regarding assistance that is provided. Use of the computer will permit the generation of the multiple reports that are required for the various functional activities.

9. <u>Departmental Systems</u>. The Forest Service's ties to and the plans for the Department's MODE system and related applications such as PADA, ADAM, and MOHR must be considered in our long-range planning. Departmental systems, as well as those sponsored by other agencies with related activities, must be considered since they can result in increased demands for information and often change data processing requirements.

10. <u>Other Applications</u>. The use of quantitative techniques such as simulation and statistical analysis, made practical by third generation computers, are either being used, or needed, more each day by Forest Service personnel. Advanced technological developments such as computer graphics, are also relatively untouched management opportunities. Current failures to provide adequate hardware, software and acceptable job turnaround time tends to discourage the use of the techniques that will be required on a routine basis in the future if we are to keep pace with the ever increasing demands upon our organization. As the result of the experience gained with these techniques, we are rapidly approaching a point at which systems to provide managers

with assistance in management decision making, and systems
to provide scientists with faster more advanced research
techniques could be implemented, if adequate computer
facilities were available.

B. Organizational Effectiveness

Confusion, duplication and ineffectiveness in varying
degrees has occurred in attempts to provide data processing
support to many areas of the Forest Service. Areas where
problems seem to exist and improvements may be needed to
strengthen organizational effectiveness are:

1. Duplication and Ineffectiveness. The necessity of
each installation independently developing and maintaining
systems and general purpose software has resulted in excessive
duplication of effort in some units. Lack of systems analyst
support has often resulted in trying to solve the problems of
ineffective systems by just speeding them up on the computer.
Computer systems analysis and design, as well as programming
by subject-matter personnel and computer specialists without
the benefit of long-range planning, has caused considerable
loss in the effectiveness of the work done.

2. Organizational Structure. The question of how we can
put this tool to work most effectively to meet the needs of
the Forest Service; and what combination of subject matter and
data processing specialists will produce optimum results; has

yet to be completely analyzed. As a result, delegations defining who should be responsible for what in the area of computer systems analysis, design, programming, implementation, operation and maintenance have not been prepared.

3. Personnel. Because of the rapid development of the computer field as a whole, as well as the growth of data processing activities in the Forest Service, trained personnel have not always been available for technical computer activities. This situation, combined with inadequate computer training for personnel at the field data input, staff and management levels has been a contributing factor in the failure of computer activities to gain full management support, which is a requirement for effective use of this tool.

4. Program Direction. The demands resulting from operational pressures have caused a concentration of much of our efforts toward coming up with the quickest solution to the immediate problem of the day, on a first-come-first-served basis. Most of our computer systems design work has not recognized the interrelationship between systems and the need to design systems to operate effectively under the conditions that will exist 5 to 10 years after the system is first proposed. This is particularly important in data processing because of the long-lead time and large investment required for computer system design and computer programming. It is also further complicated by the difficulties of trying to interchange computer programs between computers.

C. Equipment and Methods.

The skyrocketing volume of work and number of applications
has resulted in a computer workload many times that predicted
in previous studies. While this is now apparent, the best analysis
practical at the time, did not predict this rapid growth. Data
input preparation and getting data from the source to the processing
point and back again is another problem that has a direct effect
on the effectiveness with which computers are being used. Specific
considerations related to the equipment and methods needed to
support data processing activities include:

1. Owned Computers. The UNIVAC 1005's currently installed
at Regions 2, 3, 8, and 9, and the Washington Office, while
technically classed as computers, are basically card tabulators
with very limited capabilities. These machines served capably
in the applications we acquired them for. However, their limited
memories and instruction sets make them unable to handle engineering
road design work, as well as many of the other applications that
currently make up much of the work handled on the CDC 3100 computers.
In addition, almost all of the proposed applications discussed
earlier will exceed the capabilities of this equipment. Even though
the CDC 3100 computers in Region 1, 4, 5, and 6 are only a little
more than two years old, it seems probable that the computers in
Regions 5 and 6 will be saturated within another year with work
on already initiated systems. This situation is further aggrevated

by the fact that the computers in these Regions have already been upgraded to almost the maximum extent possible and it is estimated that the saturation level will be reached even before any of the previously discussed applications are implemented.

The Regional problems with existing equipment are very real. However, it has yet to be determined if we are actually making the fullest possible use of our present equipment on a Service-wide basis.

2. Contract Services. Problems being encountered in this area include duplication of development costs, need to reprogram when equipment and computer software are changed by the vendor and difficulty in interchanging programs between locations doing similar work. In spite of the problems, this approach is apparently very satisfactory in many instances. However, problems with contracting limitations and questions raised by the direction of of Departmental and General Services Administration activities has shown that a full evaluation of this area must be a part of this study.

3. Data Handling. With many of our present and proposed applications,the most costly and time consuming continuing operation is that of capturing data at its source and getting it from the source to the processing point and back again. Because of the various handlings by humans and the retranscribing required, this step in computer operations is almost the most subject to error. In view of the data collection problems and the

decentralized nature of the Forest Service, as well as overall
cost and employment limitations; improved methods in this area
are a necessity if the full potential of computers is to be
realized.

IV. STUDY OUTLINE

The study will consist of three major phases: Problem
Definition, Design and Development of plans for meeting
Forest Service computing requirements and the Implementation of
these plans. This section of the project plan discusses the
key end item achievements, or management milestones, related
to these phases. Figure 1 is a network diagram showing the
relationship of these management milestones to each other and
to the achievement of the study objective.

A. Problem Definition.

In this phase of the study, the study team will gather and
analyze the information necessary to validate and/or define the
problems related to Forest Service data processing requirements.
The following outline of steps shows the general approach to be
used in the conduct of this project.

1. Complete Inventory and Analysis of Individual
Applications and Programs. This inventory will consist of a
catalog of all existing and proposed computer applications,
(computer uses) and will include both a concise description
and comparison of applicable alternatives. An inventory of all
computer programs in use and under development will be a supplement
to the application inventory and will reference the programs
to the systems they are used in and provide a description of the
computer programs function, language and development cost. The
description of individual programs will include all information
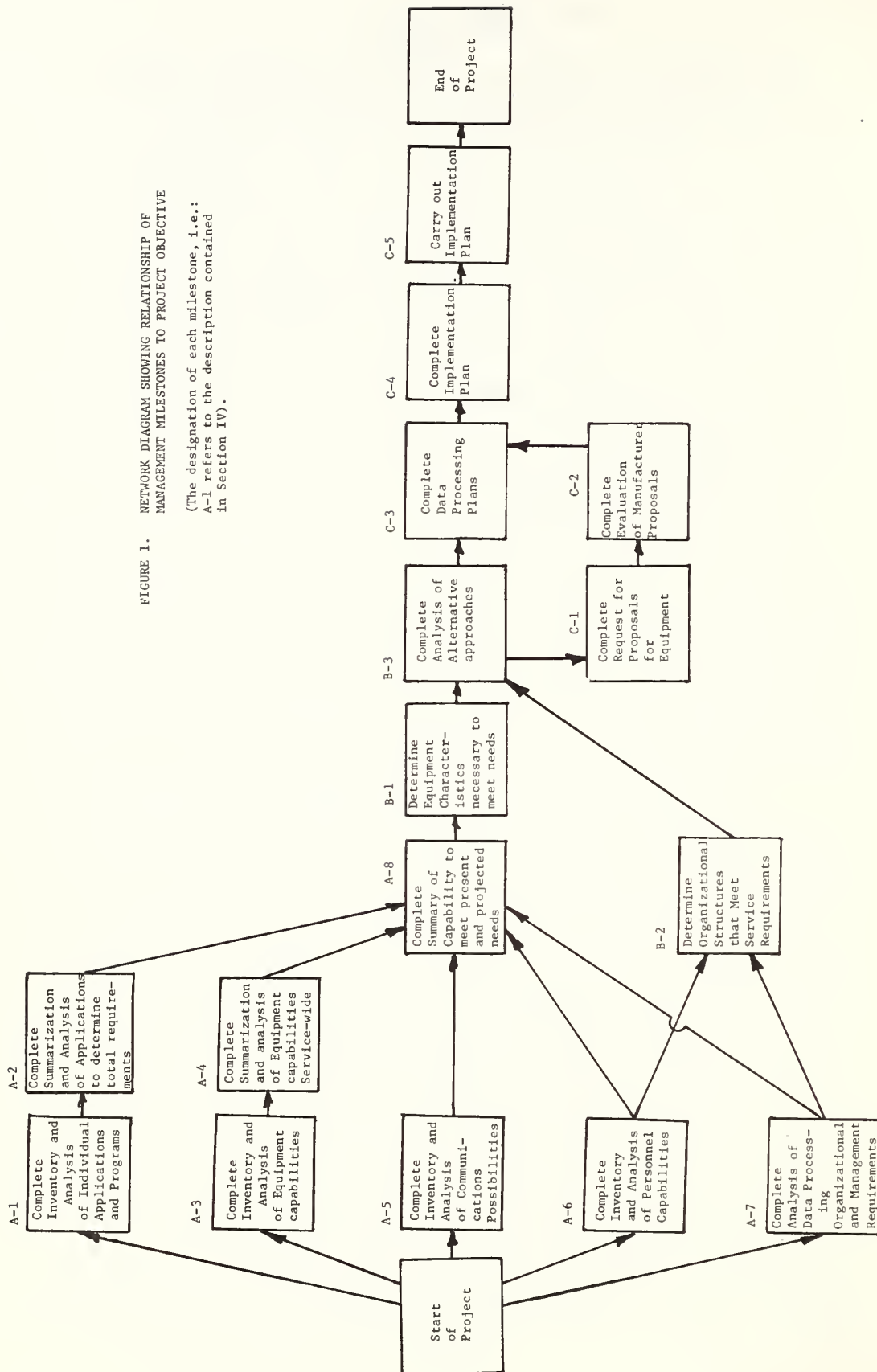needed to permit computer workload simulation. An edited version

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FIGURE 1. NETWORK DIAGRAM SHOWING RELATIONSHIP OF MANAGEMENT MILESTONES TO PROJECT OBJECTIVE

(The designation of each milestone, i.e.: A-1 refers to the description contained in Section IV).

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of this cataloged information is planned to serve as the basis for
the Service-wide exchange of information and programs. Sideboards
on reporting of single purpose applications and programs will be
developed. Sampling will be used where possible.

    2. <u>Complete Summarization and Analysis of Application to Determine
Total Requirements</u>. This step will include a summarization, validation,
and extension of the inventory of individual applications to provide
a projection of workload potential by organizational units. The
application workload potential will be expressed in terms of both data
volume which will determine equipment workload and comparative cost.
Organization staff involvement and review of applications will be obtained.
Projected undefinable computer workload expansion will also have to be
considered.

    3. <u>Complete Inventory and Analysis of Equipment Capabilities</u>.
The inventory will provide a catalog of all computing equipment and
related peripheral and supporting equipment available to the Forest Service.
It will include all data processing equipment that is owned, leased or
used under other arrangements. In addition to providing a detailed
description of all equipment in use, it will cover extent of utilization
and potential for handling an increased workload. This inventory will
also include the results of a survey of source data automation possibilities
and of other possible sources for computer services available to Forest
Service units and their potential ability and feasibility for meeting
present and projected needs.

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4. <u>Complete Summarization and Analysis of Equipment Capabilities Service-wide</u>. The report of this analysis will include a summarization of equipment capabilities and potentials by units, areas and nationally to provide a detailed picture of equipment facilities available to the Forest Service. In addition to pinpointing equipment problems, this report will identify areas where a potential for improved equipment utilization exists.

5. <u>Complete Inventory and Analysis of Communication Possibilities</u>. This inventory will provide detailed information regarding possible means of providing data communications to key computer served Forest Service locations. In addition to describing the different methods possible, the analysis will provide a comparison of capabilities and cost permitting a cost comparison for a given level of service at each key point. GSA and other Federal limitations will also be considered.

6. <u>Complete Inventory and Analysis of Personnel Capabilities</u>. This step will provide a detailed picture of the people involved with data processing activities as well as those who use it. Areas included are: (a) Skill resources and ADP understanding, (b) Classification and pay considerations, (c) Training needs and appraisal and (d) Personnel practices. Emphasis will be placed upon training needed to get understanding and optimum use of computers by Forest Service personnel.

7. Complete Analysis of Data Processing Organizational and Management Requirements. The report of this analysis will identify what organizational structure direction or policy is necessary. Development of criteria for assigning or determining management data processing priorities will be explored in this step. It will survey current data processing practices in use and related management problems including satisfaction, operational costs, budget, and productivity. It should also identify the standards of data processing performance that are needed.

8. Complete Summary of Capability to Meet Present and Projected Needs. This is the final step in the problem definition and involves summarizing the information on the relationship of the total application workload requirements to the available equipment and organizational capabilities. It will present the differences in terms of volumes of work, applications that cannot be handled, and the consequences of not implementing these proposed applications.

B. Design and Development of Plans.

In this phase of the study the information collected and summarized in the preceeding phase of the study will be analyzed, alternative approaches defined and a recommended plan for meeting Forest Service computing requirements will be developed and finalized. End items to be produced during this developmental phase of the study include the following:

1. <u>Determine Equipment Characteristics Necessary to</u>
<u>Meet Needs</u>. The product of this step would be a description of
equipment characteristics that would be necessary to provide
computer capabilities to handle both present and projected computer
applications. The resulting description of equipment require-
ments will be compared with the equipment currently available,
capable and practical for meeting Forest Service needs at the
different organizational levels or offices. Both computer
equipment and communications information will be drawn together
in this step.

2. <u>Determine Organizational Structures that Can Meet</u>
<u>Forest Service Requirements</u>. The report of this analysis will
document the evaluation of the different management, organization
and personnel approaches to satisfying Forest Service data processing
requirements. It will also summarize this information and evaluate
the alternatives in terms of available personnel resources and cost.

3. <u>Complete Analysis of Alternative Approaches</u>. In this
step the results of the organizational and equipment studies will be
combined and analyzed to determine the most feasible alternatives
or approaches for providing computer services to the Forest Service
through a cost or benefit-consequences comparison. The analysis
will produce a recommended approach to satisfy Forest Service data
processing requirements. The management decision on approval or
modification of the approach to be taken and documentation of this
decision will also be included in this step.

C. Plan Implementation.

The final phase of the project involves the finalization
and implementation of the approved data processing plan. During
this phase of the project, the study as a separate entity will
be abolished and its activities integrated into the Washington
Office Computer Systems Branch. However, the following items are
necessary management milestones on the route to project completion.

1. Complete Request for Proposals for Equipment. Based upon
the selected approach to meet Forest Service data processing
requirements, a Request for Proposals for required equipment (or
services) and a system for evaluation of the proposals will be
prepared. The resulting evaluation system will be quantitative and
completed prior to release of the Request for Proposals.

2. Complete Evaluation of Manufacturers Proposals.
This step includes the evaluation of contractors proposals in
response to the Request for Proposals and the documentation of the
decision made. The final product of this step will be the issuance
of a letter of intent to the selected contractor.

3. Complete Data Processing Plans. Work included in this
step includes the finalization and approval of the following items:
Long-range Data Processing Plan (covering policies and general
goals) and the Short-range Data Processing Plan (covering specific
key steps to be taken to direct Forest Service data processing
activities toward the goals covered by the long-range plan).

4. Complete Implementation Plan. This step will include a PERT network and schedule of all tasks necessary to implement the short-range data processing plan.

5. Carryout Implementation Plan. This final step in the project is the actual accomplishment of the various steps in the implementation plan developed in the preceeding step.

V. STUDY ORGANIZATION

The importance of this study is such that it has been established as an organizational entity under the Director of the Division of Administrative Management. However, it is anticipated that the maintenance of the Service-wide computer information base developed by this project and its planning activities will be continued by the Computer Systems Branch to provide a basis for future computer system policies and decisions, once the initial objectives of this study are achieved.

The arrangement described above will permit the concentration of the full efforts of the project study organization described in the following sections toward achieving the objective of the study in as short a time as is feasible.

As illustrated in Figure 2, the study organization and manpower resources will consist of the following major elements:

A. Steering Committee.

The membership of this steering committee has been designated as follows:

Name	Title	Unit	
Edward W. Schultz	Deputy Chief	WO Administration	Chairman
Gordon D. Fox	Assoc. Deputy Chief	WO Administration	(Alternate Chairman)
Myles R. Howlett	Acting, Asst. Director, Operations	WO Div. of Engineering	Member
Wallace R. Otterson	Deputy Director	WO Div. of Personnel Mgt.	Member
Rexford A. Resler	Deputy Director	WO Div. of Timber Management	Member
Thomas H. Ripley	Asst. to Deputy Chief	WO Research	Member
Chester A. Shields	Director	WO Administrative Management	Member
Howbert W. Bonnett	Project Leader	WO Administrative Management	Executive Secretary

The steering committee is responsible for providing overall study direction and advising the study team.

FIGURE 2. GENERAL ORGANIZATIONAL STRUCTURE OF STUDY
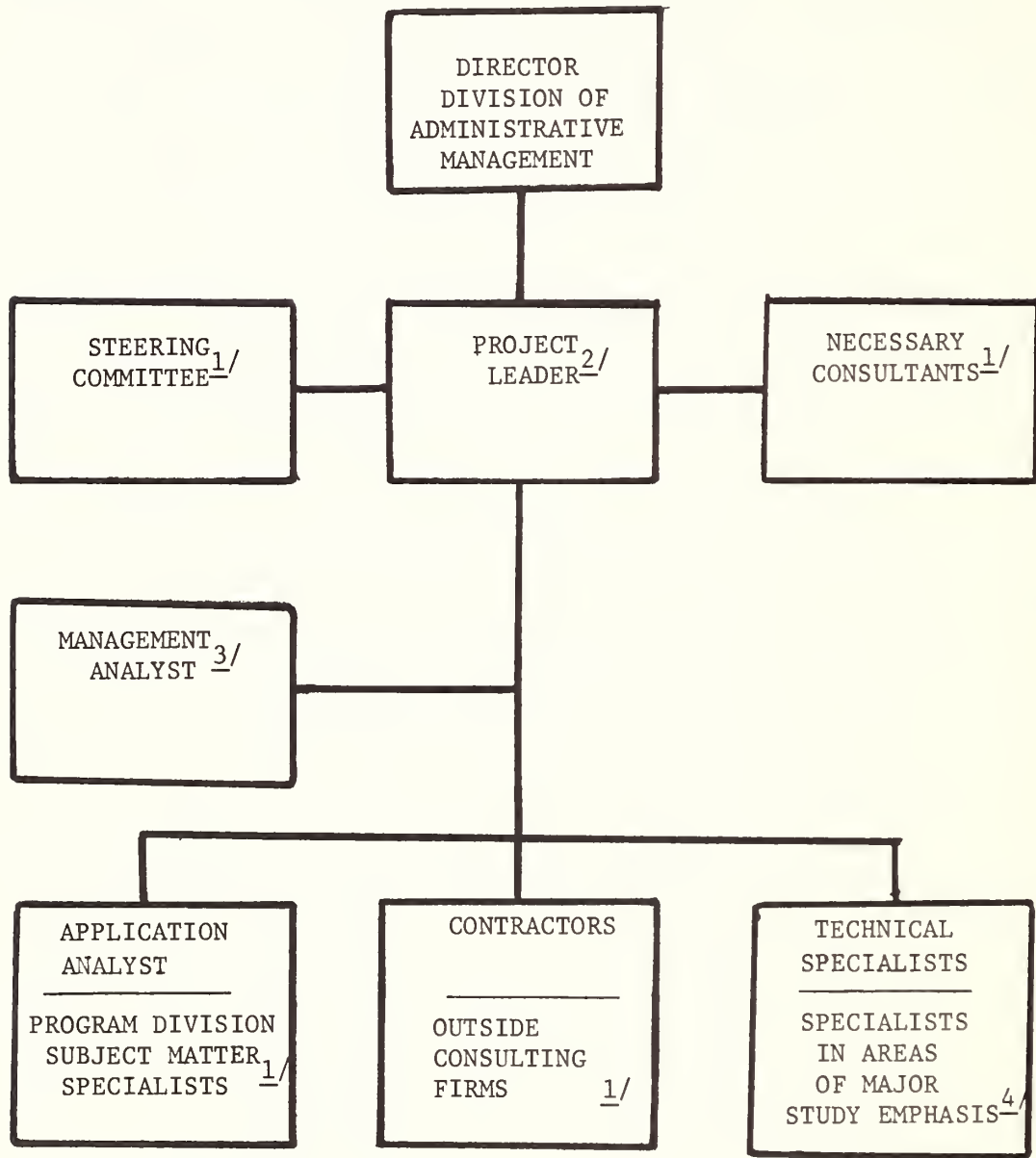
LEGEND:

1/ As Necessary
2/ Full-Time
3/ Full-Time and Additional Part-Time as Necessary
4/ Detailed Full-Time as Necessary

B. Project Leader.

The project leader, H. W. Bonnett, has been assigned to the Division of Administrative Management for the duration of the project on a full-time basis. The project leader is responsible for project conduct and coordination.

C. Management Analyst.

A management analyst, Charles P. Teague, Jr., has been assigned for the duration of the project to assist the project leader, direct studies and provide analyst counsel to the in-Service conducted portions of the study project. Additional management analyst staffing will be used in specialized study segments and during peak work periods.

D. Application Analysis.

To evaluate existing and proposed ADP applications, program Division personnel will need to be made available to the project to assist the project leader in this job. The personnel made available should have a comprehensive knowledge of the Divisions current programs and long-range plans. They should also have some experience or training in use of the computer in their field. Time required will range from several days in the case of light computer workload Divisions to a man-month for the Divisions with the heaviest workload.

E. Technical Specialists.

To assist the project leader in the evaluation of alternative solutions to Forest Service data processing requirements, necessary specialists in the areas of major study emphasis will be detailed to

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the project. Requirements for technical specialists include an estimated total of 3.7 man years of effort in the following areas:

1. Computer specialists that are available in the WO Computer Systems Branch, Regional ADP Branches and related assignments in the other units, 2.5 man years.

2. Division of Administrative Management specialists including: Communications, Organization and Workload Analysis, 0.4 man years.

3. Division of Personnel Management specialists including: Placement, Classification and Training, 0.5 man years.

4. Division of Administrative Services contracting personnel, 0.4 man years.

F. Necessary Consultants.

It is anticipated that an outside consultant actively involved in the use and management of advanced computer techniques will be employed as an advisor to the project leader on the conduct of the study. The Regional ADP Branch Chiefs and selected State and Private Forestry and Research personnel actively using computers will be consulted periodically to obtain their advice and comments regarding study direction and progress. Resource and support staff at Washington Office, Region, Station, and area levels may also be called upon for counsel and judgment.

Data which may have to be provided by all Forest Service Units includes: (1) Inventory of all computer programs. (2) Inventory and cost comparison of all existing computer applications. (3) Inventory all proposed computer applications and complete cost comparison of alternatives. (4) Inventory all existing ADP equipment used and

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available sources for contracting work. (5) Prepare information on personnel working in data processing, those using data processing and those who need to know about data processing to determine training requirements. (6) Prepare information on organization and management aspects of data processing.

G. Contract.

Where study segments can logically be contracted, outside consulting firms will be used to augment the study team efforts. The primary study segments where the use of consultants is anticipated is in the simulation of systems and the comparison of computer, communications, and source data automation equipment that is capable of meeting Forest Service processing requirements.

H. Management Sciences Staff

The Management Sciences Staff will also be utilized to review study techniques and proposed methods for data gathering and analysis and possibly to conduct some study segments.

I. Washington Office Computer Systems Branch.

The project leader will work closely with the Washington Office Branch of Computer Systems on all phases of the study.

VI STUDY SCHEDULE

Because of the many facets of this project and the large investment of resources necessary it is difficult to establish a firm time table of events and project completion date. However, the following have been established as initial goals for completion of the major facets of this plan.

A. Problem Definition - Steps 1-8   December 31, 1969

B. Design and Development of

    Plans - Steps 1-3   April 30, 1970

C. Plan Implementation - Steps

    1-4 only.   October 30, 1970

PREPARED BY:

Charles P. League Jr.
Management Analyst
Washington, D.C., March 28, 1969

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C. W. Schultz